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REPORT

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SHOULDER INVESTIGATION

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NEW YORK STATE THRUWAY  
SOUTHBOUND LANE  
MILEPOSTS 135 TO 140

STATE OF NEW YORK  
DEPARTMENT OF PUBLIC WORKS  
BUREAU OF SOIL MECHANICS

APRIL, 1958



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STATE OF NEW YORK  
DEPARTMENT OF PUBLIC WORKS

JOHN W. JOHNSON  
SUPERINTENDENT

ALBANY 1, N.Y.

April 10, 1958

Mr. C. W. Long, Chief Engineer  
New York State Thruway Authority  
Box 189  
Albany, New York

Subject: Transmittal of Report  
"Shoulder Investigation  
New York State Thruway  
Mileposts 135 to 140"

Dear Sir:

In accordance with your request of July 12, 1957 to Mr. T. F. Fitzgerald, Chief Engineer, Department of Public Works, this Bureau has performed and completed an investigation and analysis of the materials composing the southbound shoulder of the Thruway between Mileposts 135 and 140.

The results of this investigation constitute the contents of the above report, transmitted herewith.

Very truly yours,

*Wm. P. Hofmann*

Wm. P. Hofmann  
Principal Soils Engineer

WPN:CBM  
Enclosure  
cc: Mr. T. F. Fitzgerald (1)  
Mr. G. W. McAlpin (1)

W.W. R. HOFMANN  
DIRECTOR



BUREAU OF SOIL  
MECHANICS

STATE OF NEW YORK  
DEPARTMENT OF PUBLIC WORKS

JOHN W. JOHNSON  
SUPERINTENDENT

ALBANY, N.Y.

May 11, 1921

Subject: Letter transmitting to Bureau  
of Soil Mechanics information concerning  
New York State Public Works Department  
Budget for 1921 to 1922.

Mr. C. H. Lewis, Chief Engineer  
New York State Public Works Department  
Box 128  
Albany, New York

Dear Sir:

In accordance with your request of July 13, 1921 to  
Mr. T. E. Higgins, Chief Engineer, Department of Public  
Works, this Bureau has forwarded and transmitted  
below and encloses to the Bureau's corresponding  
agent at the Bureau of Standards X-12 and 13.  
The Bureau of Standards has transmitted to the  
Bureau of Soil Mechanics, transmission of the  
same of the above letter, transmission pending.

Very truly yours,

W.W. R. Hofmann  
Bureau of Soil Mechanics

cc: Mr. T. E. Higgins (1)  
Mr. G. A. Maybille (1)  
Enclosure  
ABR:GDN





(3) The work of maintaining properly constructed shoulders.

## I. PURPOSE

The work described herein comprises a continuation of the cooperative investigation concerning the general performance of the mechanically stabilized shoulders along the New York State Thruway by the Thruway Authority and the Bureau of Soil Mechanics of the Department of Public Works. The results of previous work by the Bureau were presented in a report, "New York State Thruway, New York City to Schenectady, Investigation of Performance of Shoulders", dated **REPORT** June 1956.

The following report concerns only that section of the Thruway between N.P. 135 and N.P. 140. The purposes of this particular report are as follows:

### NEW YORK STATE THRUWAY

#### SOUTHBOUND LANE

#### NILEPOSTS 135 TO 140

(A) To investigate the materials constituting the existing mechanically stabilized shoulders between the above mileposts, and making recommendations for their removal.

(B) To present recommendations concerning the requirements for new shoulder materials.

(C) To present recommendations concerning basic shoulder maintenance considerations and procedures.

(D) Using the data in (A), (B) and (C), to arrange, if possible, a test section and a control section between the above mileposts, and maintaining accurate cost records on these sections in order to indicate

(E) Suitable and economical methods and procedures for maintaining properly constructed shoulders.

State of New York  
Department of Public Works  
Bureau of Soil Mechanics

REPORT

SOURCE: INVESTIGATION

NEW YORK STATE THRUWAY  
SOUTHERN DIVISION LINE  
MILEPOSTS 132 TO 140

Report to New York  
Department of Public Works  
Bureau of Soil Erosion

April 1968

## I. PURPOSE

The work described herein comprises a continuation of the cooperative investigation concerning the general performance of the mechanically stabilized shoulders along the New York State Thruway by the Thruway Authority and the Bureau of Soil Mechanics of the Department of Public Works. The results of previous work by the Bureau were presented in a report, "New York State Thruway, New York City to Schenectady, Investigation of Performance of Shoulders", dated November 1956.

The following report concerns only that section of the Thruway between M.P. 135 and M.P. 140. The purposes of this particular report are as follows:

- (A) To investigate and describe in detail by laboratory tests, the materials constituting the existing southbound outside shoulders between the above mileposts.
- (B) To present recommendations describing the requirements for optimum shoulder materials.
- (C) To present recommendations describing basic shoulder maintenance considerations and procedures.
- (D) Using the data in (A), (B) and (C), to arrange, if feasible, a test section and a control section between the above mileposts, and maintaining accurate cost records on these sections in order to indicate:
  - (a) Suitable and economical methods and procedures for maintaining properly constructed shoulders.

and the administration a number of new traditions have been  
being developed based on previous existing ones and some  
have been set up which are likely to facilitate the further development of  
individual (not to mention only here educational) equality and quality  
from within the nation and result in the improvement of the  
whole civil society, though a lot has been done already and  
will be continuing education at high level and government  
and individual levels. Permit me to mention  
first and the policies and principles which should be adopted both in  
education and the economy and the social life of the country  
which I know at present the main features of (i)  
politics and policies which should be adopted  
in the areas of the present problems and the conditions  
existing.

(i) Policies and principles and measures of (i)  
education which should be adopted  
mainly based on different communities features of (ii)  
encouraging the multiracial character  
of education of (i) has (a) (b) (c) and (d) (e) (f)  
and policies between them so that there is a 'genuine'  
sense of principle how education must be carried  
on and as a rule of education should be carried  
out by the teacher. In this case the method (a)  
between them of carrying out principles and methods

of education should be adopted.

(b) The cost of maintaining properly constructed shoulders to achieve the desired performance in a required time.

### **II. AUTHORIZATION**

The cooperation and assistance of the Bureau of Soil Mechanics in this investigation were requested by C. H. Lang, Chief Engineer, New York State Thruway Authority, in a letter to T. F. Fitzgerald, Chief Engineer, New York State Department of Public Works, dated July 12, 1957. Authorization and permission for the Bureau of Soil Mechanics to participate in this investigation were granted by Mr. Fitzgerald.

### **III. ACKNOWLEDGMENT**

This investigation was performed under the supervision and direction of Mr. Sidney Mintzer, Senior Soils Engineer of this Bureau, in cooperation with Mr. John Pendleton of the Thruway Authority. The field sampling operations were performed by personnel of the Bureau under the direction of Kenneth L. Reitmeier, Assistant Soils Engineer.

### **IV. SAMPLING PROCEDURE**

The field sampling phase of the program was begun on August 15, 1957, and completed on August 19, 1957. The Thruway Authority supplied laborers, trucks, sampling tools and the necessary safety precautions.

The field sampling program consisted of removing representative materials from test pits dug at right angles to the pavement at intervals of 0.1 of a mile. The test pits were approximately

functions of Congress which affect the Army will (d) concern itself with the condition of and funds

for the support of the military departments, and (e) administer the War Department.

#### DEPARTMENT OF STATE

functions. First, the general and the Secretary have been and now remain with  
respect to State and all other bureaus from making them a part of  
the Department; all of which makes it a difficult question where they will  
have their offices. The Department agents must now consider which

of these will best administer the various matters. There will probably  
be a difficulty in finding a place which will accommodate all of them. Next

#### DEPARTMENT OF THE ARMY

has and will have with respect to making one and organizing with  
which the members of the Senate, House of Representatives, and the President  
are concerned the additional and all the different kinds of  
matters which have been before your committee and those which will be referred  
herein and elsewhere. The members of the Senate have agreed with the former  
and will act upon the same.

#### DEPARTMENT OF THE NAVY

which are engaged now in connection with the various questions before it will  
be concerned with (a) the amount we have spent for (b) the  
various expenses and how much money, which general ledger  
accounts you have. The following, among others, will be  
involved in the actions which we take and will therefore be  
considered more fully than any other which may be taken by the above-named de-

one foot wide, six feet long, with an average depth of four inches. The material was removed from the test pit, laid on a tarpaulin, thoroughly mixed and then a minimum of 50 pounds was bagged to comprise the representative sample for laboratory testing purposes. Due to the constant replacing of material along the edge of the pavement by maintenance operations, the test holes were not excavated closer than one foot from the edge of the pavement in order to indicate the characteristics of the bulk of the material comprising the shoulders. However, at intervals of approximately 0.2 of a mile, separate samples were taken immediately adjacent to the pavement edge to indicate the characteristics of the material currently being used to maintain the shoulders.

Forty-six locations were tested in which samples were taken not closer than one foot from the edge of the pavement. At 23 of these locations, separate samples were taken of the material lying adjacent to the pavement, making a total of 69 samples recovered for laboratory purposes.

## V. SUMMARY OF LABORATORY TEST RESULTS

Table I "Summary of Laboratory Test Results" shows results of the laboratory classification tests performed on each of the 69 samples. Samples designated as "A" after the laboratory numbers were samples extracted immediately adjacent to the pavement edge. The results of the laboratory tests show that:

- (1) Sixty-seven of the 69 samples tested contained percentages of material passing the 1/4 inch sieve considerably exceeding 65 percent. The average of the percentages passing the 1/4 inch sieve was 83.3.

卷之三十一

ovis doni 411 ad prius. Hinc etiam invenimus  
in scriptis et ceteris libri titulis quodammodo  
autem esse vobis donum 411 ad prius.

(2) Many of the samples contained material larger than 2-1/2 inches. The average of the percentages of all samples exceeding 2-1/2 inches was 2.9.

(3) The average of the percentages passing the No. 200 sieve was 14.7.

(4) The average of the plasticity indices of the samples was 1.7.

(5) The soundness of the coarse fractions of the materials, as indicated by the magnesium sulfate test, was good. The average of the percent losses from the soundness test was 5.3.

## VI. ANALYSES OF LABORATORY TEST RESULTS

The specifications for Item 2596, "Calcium Chloride Treated Gravel Shoulders", under which these shoulders were constructed require that 100 percent shall pass the 2-1/2 inch sieve; not more than 65 percent shall pass the 1/4 inch sieve; and not less than 10 percent nor more than 20 percent shall pass the No. 200 sieve.

It is obvious from V(1) and V(2) that the shoulders investigated in this section contain a considerable proportion of material exceeding 2-1/2 inches in size and far too high a percentage of material passing the 1/4 inch sieve to conform to the requirements for Item 2596. This condition is illustrated in Fig. 1.

Either the material installed during the original construction of these shoulders did not conform to Item 2596, or material added during subsequent maintenance adversely altered the grain size characteristics of the original material.

政治小説 THE DEPARTMENT OF TIME 17

butchered at the same time. The meat was very lean (10% fat) and  
had been prepared under extremely hygienic conditions. "Pork" meat, however,  
was also present and 25% fat was being made because 25% fat is required  
and meat has greater than 25% fat when there is no pork. It is  
noted that only 10% fat was being made because 10% fat was the starting point.  
A number of problems were noted. (1) There (10%) meat contained all the  
information that could possibly be obtained from a whole animal. All the  
information in the meat came from the animal and nothing else. (2) The  
meat was not very good quality — 10% fat and 10% water  
and therefore, tasting like salt water and flavorless. The texture was not good.  
The texture of 40% fat or more meat is much better. The texture is  
more fibrous and the taste is more intense. The texture of 10% fat  
is not good. The texture is not good and the flavor is not good.

Gravel exceeding 2-1/2 inches in size does not adversely affect the stability of the shoulder, but it does cause maintenance difficulties because the cobbles are continuously being plucked out during the necessary manipulation required by proper maintenance.

However, too high a percentage of the material passing the 1/4 inch sieve does adversely affect the stability, particularly during the spring thaws. Also, too high a percentage of such sizes contributes to shoving, dusting and whipping during dry weather.

It is the opinion of this Bureau that the percentage of the minus No. 200 size in any mechanically stabilized shoulder material should vary between 10 and 20 percent. V(3) above, indicates that the existing shoulder material conforms to this opinion, and conforms to the requirements of Item 259C in this respect. This percentage range is generally suitable for mechanically stabilized mixtures only.

It is also the opinion of this Bureau that mechanically stabilized shoulder materials should possess some reasonable plasticity index, preferably not less than 3, but not greater than 6. This P.I. range is generally suitable for mechanically stabilized mixtures only.

## VII. RECOMMENDATIONS, CONSTRUCTION AND RECONSTRUCTION

This Bureau offers the following recommendations concerning the requirements governing mechanically stabilized shoulder materials to be used in construction and reconstruction of shoulders:

The most interesting feature of the present study is the finding that the mean age at first marriage was 21.5 years for women in the 1960s, which is 2 years earlier than the mean age at first marriage for women in the 1950s.

(1) Gradation: The material should be well graded from coarse to fine and conform to the following:

<u>Size</u>	<u>Percent Passing by Weight</u>
2-1/2 inch sieve	100
1/4 inch sieve	30 to 65
No. 200 sieve	10 to 20

(2) Soundness: The percent loss of the coarser fraction (+1/4 inch) after four cycles of the magnesium sulfate test should not exceed 30. This maximum loss should be considered tentative, since research is presently being performed by this Bureau in order to establish a rational limit for shoulder materials in this respect. In the interim, 30 percent is considered a reasonable limit.

(3) Plasticity: The fraction passing the No. 40 sieve should have a liquid limit not exceeding 25, and a plasticity index not greater than 6. (As indicated in V(1) above, some plasticity of the fines is desirable and, if possible, materials having P.I.'s approximating 3 should be used.)

(4) The percentage passing the No. 200 sieve shall not be greater than two-thirds of the percentage passing the No. 40 sieve.

The above recommended requirements are an expansion of the requirements of Item 590, "Stabilized Gravel Surface Course, Calcium Chloride Treatment", Public Works Specifications of January 2, 1957.

The above requirements may be modified to utilize local materials, provided that the results of adequate laboratory tests and/or



past performance indicate that such materials are suitable. This particularly applies to the use of stone screenings, where experience indicates that stone screenings from some sources are suitable for the construction of adequate shoulders.

To obtain satisfactory shoulder performance, it is essential that the shoulders be provided with thoroughly compacted, well drained subgrades composed of suitable materials. Shoulders require adequate subgrade support in order to satisfactorily sustain occasional heavy wheel loads during all seasons of the year; however, stable shoulder subgrades are particularly necessary during the spring thaws.

### VIII. RECOMMENDATIONS, MAINTENANCE

The performance of shoulders depends, not only upon the characteristics of the materials constituting the shoulders and the subgrade foundations thereof, but upon the frequency and quality of maintenance provided. Shoulders may be constructed of materials possessing optimum characteristics, but if inadequate maintenance is performed, the shoulders will, in general, revert to an unsatisfactory condition. On the other hand, it is also quite possible that shoulders, composed of materials reasonably deviating in characteristics from the optimum standards, will show adequate performance if adequate maintenance is provided. The latter type of shoulders obviously requires a somewhat higher degree of maintenance than do those composed of materials conforming to optimum standards. The importance of proper maintenance procedures on shoulder performance cannot be over-emphasized.

The time, frequency and type of shoulder maintenance operations greatly influence shoulder performance. This Bureau

and information and education about their nutritional requirements from their teacher and parents. While the first set of findings identified many positive outcomes and experiences quite early on, initial concerns about the implementation of the curriculum and the addition of the new curriculum were raised by students and teachers. The students' initial reactions were mixed, with some students expressing ambivalence and others expressing negative feelings. The teachers' initial reactions were also mixed, with some teachers expressing ambivalence and others expressing positive feelings. The students' initial reactions were mixed, with some students expressing ambivalence and others expressing positive feelings. The teachers' initial reactions were also mixed, with some teachers expressing ambivalence and others expressing positive feelings.

the new plan has allowed officials to enhance all the methods and practices available to reduce emissions from energy use and power generation, thereby reducing the greenhouse gas levels in the atmosphere. The plan includes the following measures to reduce emissions: a carbon tax, a cap-and-trade system with decreasing carbon limits at fixed rates and no conditions, restrictions on oil pipelines designed to banish pipeline crude oil imports, the greenhouse gas tax and regulation, and a policy that will deliver an equivalent amount of revenue from oil pipelines and fossil fuels to support climate mitigation efforts. The government also plans to banish oil imports by 2050.

recommends the following basic considerations as being extremely important and necessary in the proper maintenance of shoulders to result in satisfactory performance:

- (1) Shoulders should be manipulated, bladed and rolled only when the moisture content of the material is at or slightly above the optimum necessary for proper compaction and maximum density. The optimum moisture and manipulation conditions usually occur, naturally, during the spring and fall. Major shoulder maintenance operations should, therefore, be performed during these seasons. During prolonged dry periods, such as in the summer, it is usually necessary to add water to achieve adequate density of the shoulder material.
- (2) If it becomes necessary to add material to a shoulder, the material added should be of suitable gradation and quality so as to benefitiate the characteristics of the existing shoulder material, if such does not possess the optimum characteristics. If the existing shoulder material is of the optimum gradation and quality, any material added should maintain those optimum characteristics in the resulting mixture. The application of additional material to a shoulder should always result in either approaching or maintaining the optimum requirements for shoulder materials, as recommended in VII above.
- (3) The practice of adding a relatively thin layer of new material to the relatively dry, compact surface



of a shoulder to eliminate the "drop-off" at the edge of the pavement, should be avoided. The layer of material added in this manner will usually not properly integrate or bind with the compact surface of the existing shoulder, regardless of whether calcium chloride is first applied, and, consequently, may soon be removed by the action of the various factors that caused the "drop-off" in the first place. If it becomes necessary to build up a shoulder, the existing compact shoulder surface upon which the additional material is to be placed should first be scarified and loosened, so that the additional material and calcium chloride can be incorporated into the shoulder to provide an integral course.

- (4) Shoulders should be compacted with a suitable and adequate roller after manipulation and blading, particularly after incorporation of additional material. Thorough rolling is very important and necessary, since the occasional traffic which a shoulder receives cannot be depended upon to achieve required densities; thorough rolling is necessary.
- (5) As stated in (1) above, both the material added to the shoulder, as well as the scarified or loosened layer, must be at the optimum moisture content immediately prior to compaction by rolling, if the necessary density is to be attained. To achieve this optimum condition of moisture, it may be necessary to add water, or calcium chloride in solution form.



(5) Suitable moisture conditions may be preserved in shoulder material stockpiles by incorporating the calcium chloride in flake form during the formation of the stockpiles.

(6) For the purpose of structural stabilization of the shoulder course, calcium chloride should be incorporated into the material when it is in a loose or scarified condition. The stabilization effect of placing calcium chloride, either in flake or solution form, on an impermeable compact shoulder surface is generally limited, and this treatment should, therefore, be considered for dust and surface moisture control purposes only.

(7) Calcium chloride in flake form is only effective when there is sufficient moisture in the soil or air to satisfy its hygroscopic and deliquescent actions. These actions are severely retarded when applications are made to dry soils in hot, dry periods of prolonged drought. Surface applications, in flake form during such periods, are generally ineffective since the chemical cannot pick up sufficient moisture from the air before the flakes are whipped away. Surface applications during dry periods should be done in solution form, or the surface should be thoroughly moistened before application in flake form.

(1) Influencing the gene expression, metabolic pathways  
and physiological traits and leading to the reduction of  
soil nutrient uptake, crop growth and ultimate yield.  
The reduction of soil nutrient uptake and yield loss  
are mainly due to the reduction of root length and the cold  
and the nutrient limited conditions in the growing season; (2)  
second, soil biotic interactions with the various microfauna  
to cause a lot of the root system damage and increasing  
the possible nutrient losses with additional nutrient losses  
which result in further nutrient depletion, reducing  
crop yield and causing significant economic loss.  
Therefore, there are two main reasons for the  
influence of soil microfauna on plant growth:  
one is the lack of soil microfauna activity which  
leads to the decrease of soil nutrient uptake and  
the other is the increase of soil nutrient uptake  
and the reduction of root length and yield loss.  
The reduction of soil nutrient uptake and yield loss  
are mainly due to the reduction of root length and the cold  
and the nutrient limited conditions in the growing season;

It is obvious, after a consideration of the above factors, that the most desirable times for major shoulder maintenance operations are in the spring and fall of the year when the material is naturally close to its optimum moisture content for efficient blading and compaction.

#### IX. SUGGESTED TEST SECTIONS

In order to properly evaluate the performance of mechanically stabilized shoulders, it is important to know the average annual cost required to adequately maintain a unit length of properly constructed shoulder. Such information is essential in any overall economic comparison between the first costs and annual maintenance costs of mechanically stabilized shoulders and any other types of shoulders. The average annual unit maintenance cost can be determined with reasonable accuracy by keeping a complete record of the cost required to adequately maintain a shoulder test section composed of suitable materials. Such a test section can be arranged by reconstructing a section of reasonable length to conform to requirements of a suitable shoulder material, or choosing a section where the existing materials are considered to be in conformance with suitable shoulder material requirements. The existing shoulders of some portions of the Thruway are composed of suitable materials. Preliminary investigations by this Bureau indicate that the southbound shoulder of the section between Kingston and Whitesboro is composed of materials conforming with near optimum requirements. (See "New York State Thruway, Investigation of Performance of Shoulders", November, 1956).

Wetland areas and their characteristics in relation to water quality

and the other two were to be built in parallel tracks.

When you're looking for a new car, it's important to make sure you're getting the best deal. That's why we offer a variety of financing options to help you get the car you want.

Control sections of reasonable lengths should also be arranged on shoulders composed of materials representing the average Thruway shoulder condition, in order to determine the difference in cost, if any, necessary to properly maintain shoulders composed of optimum and average materials.

The Bureau of Soil Mechanics would be very interested in co-operating with the Thruway Authority in such a program.

#### X. CONCLUSIONS

- (1) The materials composing the existing southbound outside shoulder between M.P. 135 and 140 do not conform to Item 259G, containing:
  - (a) Material exceeding 2-1/2 inches in size.
  - (b) Excessive percentages of minus 1/4 inch size.
- (2) The requirements and characteristics of an optimum material for mechanically stabilized shoulders are recommended in VII above.
- (3) Basic and important shoulder maintenance considerations, procedures and methods necessary for satisfactory mechanically stabilized shoulder performance are recommended in VIII above.

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Wm. P. Hofmann  
Principal Soils Engineer

the following table which illustrates the conditions existing  
between the two countries and between the two countries and India, the  
former being the most favourable, and the latter the least favourable.  
The following table gives the number of cases of cholera and other  
diseases, both native and foreign, occurring in each State, and the  
number of deaths registered during the year 1858.

Comparative statistics will follow on different pages (1) to  
(4) and (5) to (8), which record subjects as follows:  
1. Statistics of population, 20(E and) or surface  
area of each State; 2. Comparative Intensity (a) of  
death rate, & (b) relative to mean mortality of States (d);  
3. Comparative death rate from cholera and other diseases

(c) and comparative death rate from cholera and other  
diseases (e) and comparative death rate from cholera and other  
diseases (f) and comparative death rate from cholera and other  
diseases (g) and comparative death rate from cholera and other  
diseases (h) and comparative death rate from cholera and other  
diseases (i).

The following table gives the number of cases of cholera and other  
diseases, both native and foreign, occurring in each State, and the  
number of deaths registered during the year 1858.

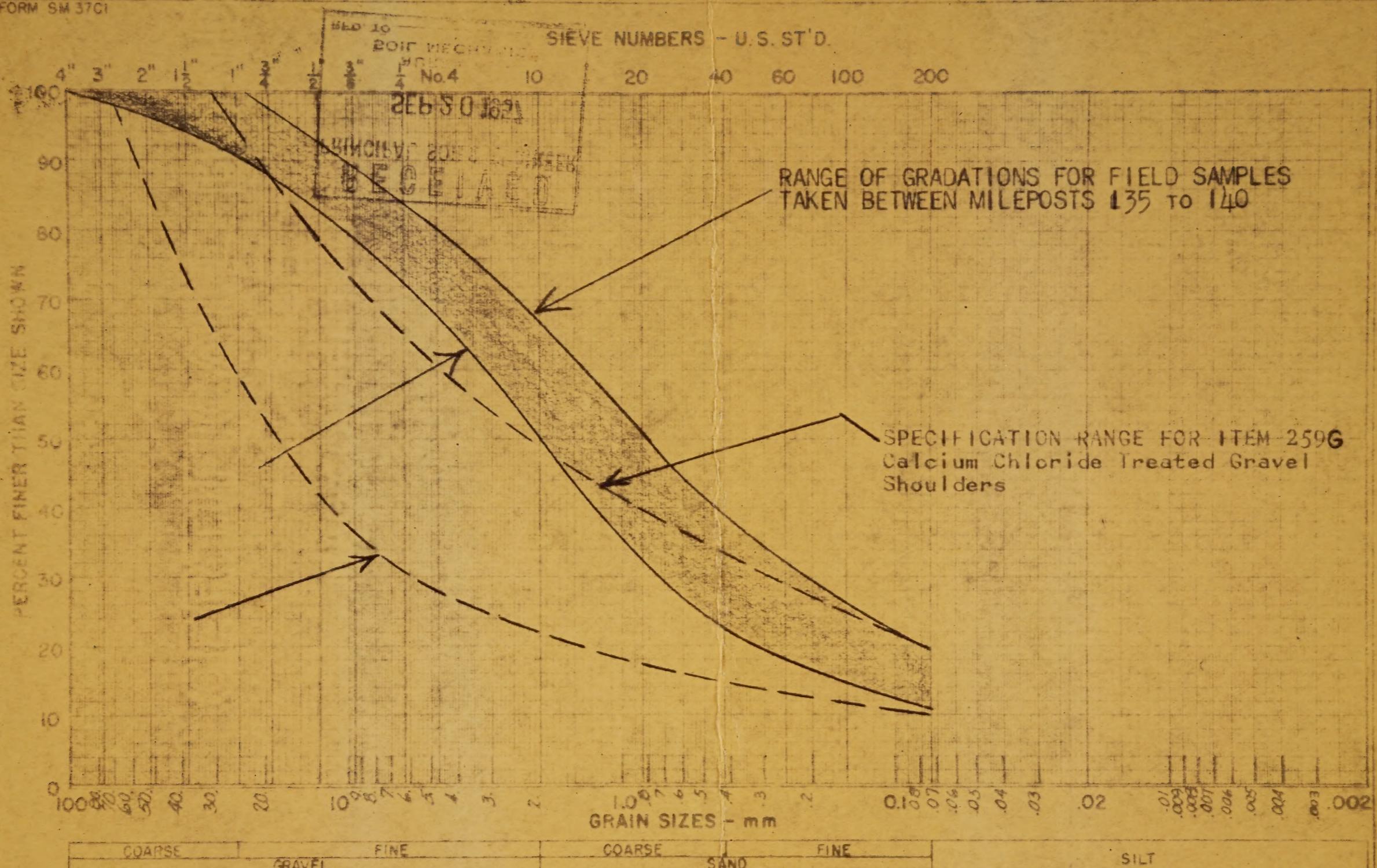
Comparative statistics (continued)





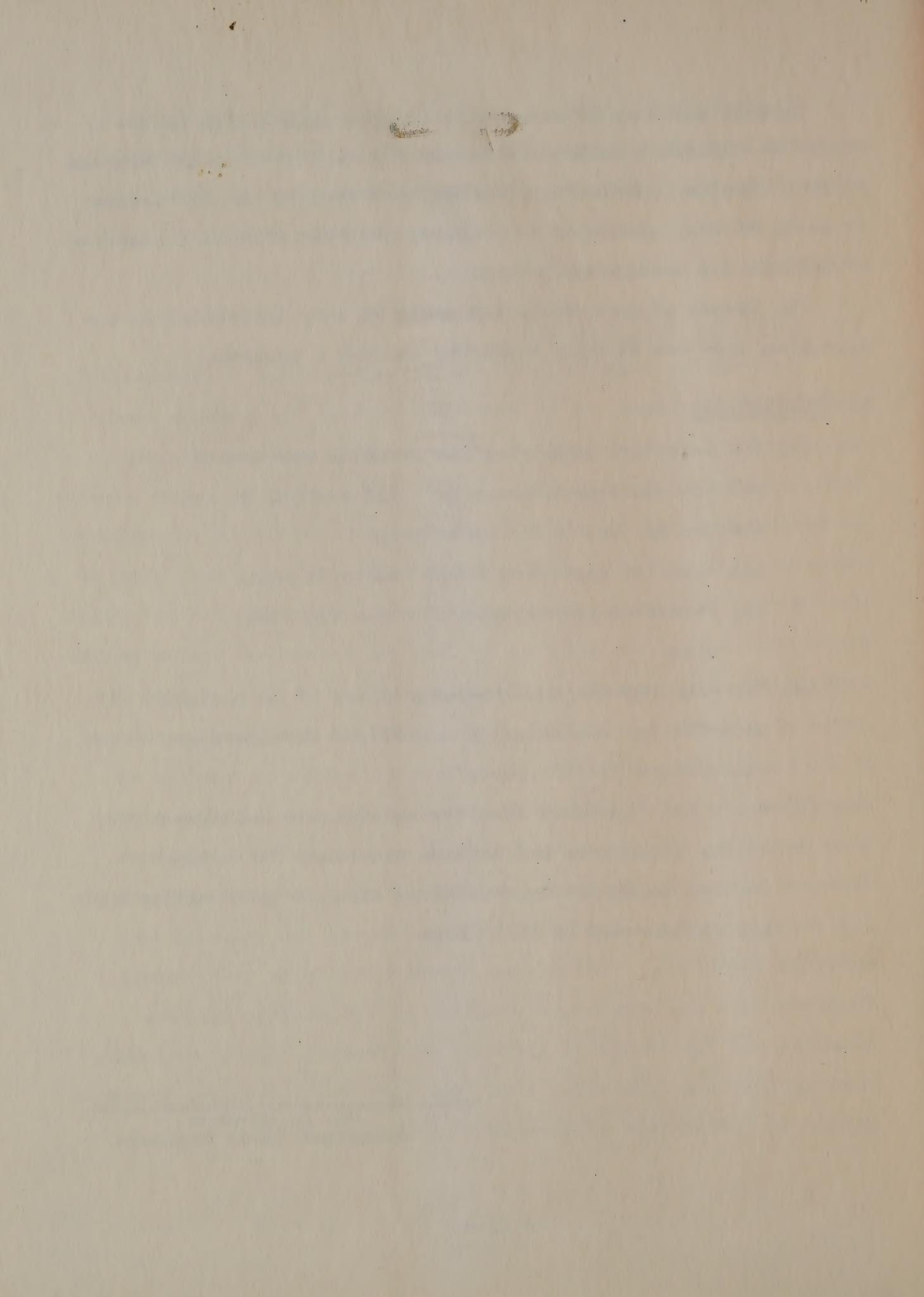






PROJECT NEW YORK STATE THRUWAY SHOULDER INVESTIGATION-AUGUST 1957  
 SAMPLE NO. DISTRICT 100 INCHES FROM COUNTY ALBANY  
 STATION OFFSET EDGE OF PAVEMENT DEPTH 0 TO 4 INCHES  
 DATE SEPT. 18, 1957 DRAWN BY S. MINTZER

STATE OF NEW YORK  
 DEPARTMENT OF PUBLIC WORKS  
 DIVISION OF CONSTRUCTION  
 BUREAU OF SOIL MECHANICS  
 GRAIN SIZE DISTRIBUTION CURVE



SEPTEMBER 23, 1957  
TABLE I

STATE OF NEW YORK - DEPARTMENT OF PUBLIC WORKS  
BUREAU OF SOIL MECHANICS

NEW YORK STATE THRUWAY SHOULDER PROJECT

SUMMARY OF LABORATORY TEST RESULTS  
MILEPOSTS 135 TO 140  
AUGUST, 1957

SOUTHBOUND OUTSIDE SHOULDER ONLY

MILEAGE LOCATION	LABORATORY NUMBER	PERCENT FINER THAN SIEVE										% #2-1/2"	200 40	L.L. %	P.I.	% Loss Mg SO4	
		2-1/2"	2"	1"	1/4"	#4	#10	#40	#60	#100	#200						
361 So. M.P. 140	1A	100.0	99.3	96.5	83.2	79.2	60	10.8	15.3	13.1	10.8	4.6	7.5	55.7	19.0	0.6	--
601 So. of 4TH MARKER SO. OF MP. 140	2	100.0	99.0	92.6	75.9	72.3	60	21.0	17.3	14.7	12.5	5.9	0.0	56.8	19.3	2.8	7.7
531 So. of 8TH MARKER SO. OF MP. 140	3A	100.0	98.8	93.7	83.1	80.2	59.5	27.0	27.3	27.3	27.1	6.1	0.0	56.8	19.0	2.3	4.3
391 So. of 12TH MARKER SO. OF MP. 140	4	100.0	99.6	90.0	73.3	69.5	58.6	29.6	27.3	27.3	16.3	5.8	0.0	56.1	17.7	0.9	--
621 So. of 16TH MARKER SO. OF MP. 140	5A	100.0	98.1	95.4	82.5	81.1	63.4	21.6	17.6	16.0	13.0	5.4	0.0	53.0	15.9	0.5	--
581 So. of 20TH MARKER SO. OF MP. 140	6	100.0	99.0	92.3	81.8	77.0	59.3	24.1	20.9	17.2	14.0	5.0	0.0	61.7	20.4	1.6	--
741 So. of 30TH MARKER SO. OF MP. 140	7A	100.0	98.4	95.6	80.1	71.6	57.3	19.2	16.7	14.0	12.4	4.4	0.0	64.1	24.1	1.2	--
341 So. of 34TH MARKER SO. OF MP. 140	8	100.0	97.2	92.9	75.9	75.4	59.4	23.7	20.1	17.2	14.2	4.2	0.0	64.4	24.0	0.9	5.2
501 So. of 2ND MARKER SO. OF MP. 139	9A	100.0	99.2	96.2	86.7	81.1	70.9	45.1	41.5	36.9	29.7	2.5	0.0	52.4	27.6	NP	--
631 So. of 6TH MARKER SO. OF MP. 139	10	100.0	97.4	97.3	86.5	74.9	43.5	21.4	18.6	14.1	10.0	5.1	0.0	50.0	17.9	1.8	--
551 So. of 10TH MARKER SO. OF MP. 139	11A	100.0	97.3	92.5	82.9	63.4	28.4	21.2	20.8	16.0	12.0	6.8	0.0	56.4	18.9	2.6	--
441 So. of 14TH MARKER SO. OF MP. 139	12	100.0	99.4	93.0	83.0	78.9	61.0	25.0	20.4	17.4	13.7	6.3	0.0	54.7	18.9	3.0	--
611 So. of 18TH MARKER SO. OF MP. 139	13A	100.0	99.0	97.1	90.3	85.0	65.0	23.7	19.5	16.4	12.3	4.7	0.0	42.5	16.5	NP	--
351 So. of 22ND MARKER SO. OF MP. 139	14	100.0	98.0	95.1	86.9	83.5	61.0	27.9	22.7	18.6	15.6	6.5	0.0	45.2	17.6	1.4	--
551 So. of 26TH MARKER SO. OF MP. 139	15A	100.0	97.9	91.9	82.0	80.3	63.1	25.3	21.0	17.8	14.0	6.2	0.0	55.4	17.9	1.3	--
491 So. of 30TH MARKER SO. OF MP. 139	16	100.0	98.1	96.5	85.0	87.3	69.9	21.6	22.5	18.7	15.7	6.2	0.0	52.2	17.6	--	--
431 So. of MP. 138	17A	100.0	98.0	98.0	93.8	73.5	52.0	25.0	25.5	22.7	17.3	7.1	0.0	42.6	21.3	--	--
521 So. of 4TH MARKER SO. OF MP. 138	18	100.0	98.6	98.3	88.1	79.5	69.9	32.5	28.2	24.1	13.8	4.8	0.0	52.6	20.6	4.8	--
451 So. of 8TH MARKER SO. OF MP. 138	19A	100.0	98.3	95.3	86.0	85.0	65.0	23.7	19.5	16.4	12.3	4.7	0.0	52.6	17.9	1.9	--
711 So. of 12TH MARKER SO. OF MP. 138	20A	100.0	99.0	92.0	82.0	75.5	57.5	27.7	22.7	19.7	14.3	4.0	0.0	52.9	22.9	--	--
621 So. of 16TH MARKER SO. OF MP. 138	21A	100.0	97.3	92.4	82.0	80.0	78.4	22.5	22.5	22.5	18.6	6.2	0.0	51.6	21.6	--	4.7
341 So. of 20TH MARKER SO. OF MP. 138	22A	100.0	97.1	92.9	82.0	81.1	77.1	22.4	21.2	21.2	22.8	2.9	0.0	58.9	16.2	0.2	6.2
711 So. of 24TH MARKER SO. OF MP. 138	23A	100.0	99.0	92.8	82.0	78.5	69.4	34.3	31.7	28.8	20.9	2.4	0.0	42.0	16.0	--	6.0
351 So. of 28TH MARKER SO. OF MP. 138	24A	100.0	97.9	92.2	85.5	82.0	70.0	35.2	35.2	28.4	23.8	6.8	0.0	47.7	15.2	--	7.8
391 So. of 32ND MARKER SO. OF MP. 138	25A	100.0	98.0	98.4	86.4	81.6	69.4	29.7	25.4	21.6	16.3	5.1	0.0	51.8	15.2	--	--
561 So. of 36TH MARKER SO. OF MP. 138	26	100.0	98.2	92.8	82.3	78.3	62.3	31.4	23.4	21.6	14.2	5.9	0.0	45.4	14.7	--	--
541 So. of MP. 137	27	100.0	98.1	95.1	85.5	82.3	62.1	31.2	31.2	31.2	24.7	4.9	0.0	43.6	14.6	--	--
531 So. of 4TH MARKER SO. OF MP. 137	28	100.0	98.3	92.3	86.4	82.0	70.0	52.7	51.8	48.8	27.5	4.4	0.0	47.6	16.2	2.3	--
791 So. of 8TH MARKER SO. OF MP. 137	29A	100.0	96.4	93.2	83.3	79.4	68.0	41.0	36.7	36.7	21.1	5.2	0.0	40.2	10.2	--	--
851 So. of 12TH MARKER SO. OF MP. 137	30	100.0	97.3	92.6	76.5	76.3	75.3	61.4	50.5	48.3	24.0	5.0	0.0	43.7	15.0	--	--
451 So. of 16TH MARKER SO. OF MP. 137	31A	100.0	98.3	92.6	88.6	76.3	62.3	56.7	28.8	24.7	20.9	7.3	0.0	52.6	18.4	--	NP
651 So. of 20TH MARKER SO. OF MP. 137	32	100.0	97.7	91.3	76.3	72.7	62.7	52.4	29.4	28.7	23.7	5.7	0.0	48.4	17.1	0.6	--
641 So. of 24TH MARKER SO. OF MP. 137	33A	100.0	98.0	97.3	82.3	80.0	78.0	62.7	51.4	47.4	31.7	5.7	0.0	44.6	17.1	--	--
451 So. of 28TH MARKER SO. OF MP. 137	34A	100.0	98.3	94.0	88.2	81.1	70.0	35.2	35.2	28.4	23.8	5.1	0.0	40.3	12.3	--	--
361 So. of 32ND MARKER SO. OF MP. 137	35A	100.0	98.3	92.7	82.3	78.3	62.3	56.7	52.4	47.4	33.7	5.7	0.0	45.3	12.3	--	--
381 So. of 36TH MARKER SO. OF MP. 137	36A	100.0	98.3	92.7	82.3	78.3	62.3	56.7	52.4	47.4	33.7	5.7	0.0	45.3	12.3	--	--
181 So. of MP. 136	37A	100.0	98.9	94.9	86.4	82.0	70.0	52.7	38.6	34.2	27.5	7.5	0.0	46.3	12.3	--	--
501 So. of 8TH MARKER SO. OF MP. 136	38	100.0	98.3	92.3	86.4	82.0	70.0	52.7	38.6	34.2	27.5	7.5	0.0	47.6	12.3	--	--
151 So. of 12TH MARKER SO. OF MP. 136	39A	100.0	98.7	96.7	87.1	83.1	71.1	51.3	44.1	36.7	28.5	5.3	0.0	43.7	12.3	--	--
431 So. of 16TH MARKER SO. OF MP. 136	40	100.0	98.1	92.7	87.3	77.6	69.0	51.4	47.4	40.5	29.4	5.3	0.0	52.6	12.3	--	--
611 So. of 20TH MARKER SO. OF MP. 136	41A	100.0	98.1	92.7	86.0	81.1	65.9	52.4	47.4	40.5	29.4	5.3	0.0	44.6	12.3	1.6	--
361 So. of 24TH MARKER SO. OF MP. 136	42	100.0	98.7	96.6	88.1	82.4	69.6	55.4	43.3	37.0	22.6	10.6	0.0	47.1	12.3	--	--
781 So. of 28TH MARKER SO. OF MP. 136	43A	100.0	99.7	89.1	87.3	81.0	68.0	52.7	47.4	40.5	29.4	5.3	0.0	56.3	12.3	1.8	--
611 So. of 32ND MARKER SO. OF MP. 136	44	100.0	97.1	91.3	87.3	81.1	67.6	50.9	42.2	37.0	22.6	10.6	0.0	52.5	12.3	1.0	--
591 So. of 36TH MARKER SO. OF MP. 136	45A	100.0	96.9	94.8	87.1	82.8	62.9	50.8	42.2	37.0	22.6	10.6	0.0	52.6	12.3	1.1	--
521 So. of MP. 135	46	100.0	98.8	90.2	86.5	76.0	56.5	45.0	37.0	31.1	19.2	7.2	0.0	49.4	12.3	0.9	--
AVERAGE		100.0	99.2	94.9	83.3	79.2	62.8	29.1	24.3	20.3	14.7	6.0	2.9	51.4	18.3	1.7	5.3
CALLANAN WASHED SCREENINGS																	
GILLIESPIE PIT UNWASHED SCREENINGS																	
GILLIESPIE PIT GRAVEL (AVERAGE 7 SAMPLES)																	
GILLIESPIE PIT OVERBURDEN		100.0	98.4	94.2	88.8	61.4	35.5	21.0	26.7	25.2	23.5	10.8	0.5	21.4	NP	--	--
		100.0	100.0	92.8	60.8	56.3	42.0	29.0	26.7	25.2	23.5	10.8	0.5	55.1	18.4	5.7	14.2

REMARKS: THE SAMPLES DESIGNATED AS "A" WERE ALL TAKEN AT 0" - 17" FROM EDGE OF PAVEMENT.

**00415**



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